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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/820,072	03/28/2001	Wen-Yen Hwang	PAT004	4037

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APPLIED OPTOELECTRONICS, INC.
13111 JESS PIRTLE BLVD.
SUGAR LAND, TX 77478

EXAMINER

NGUYEN, JOSEPH H

ART UNIT PAPER NUMBER

2815

DATE MAILED: 10/08/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/820,072

Applicant(s)

HWANG, WEN-YEN

Examiner

Joseph Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) 30-34 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-29 and 35-38 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

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DETAILED ACTION

Election/Restrictions

Applicant's election of claims 1-28 and 35-38 in Paper No. 5 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Therefore, claims 1-28 and 35-38 are hereby prosecuted whereas claims 29-34 are withdrawn from consideration.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2-3, 17-18, 21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The limitation in these claims is not definite since y is not clearly defined in a measurable value or range in the similar manner as the value of x is defined thereon.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United

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States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1-28 and 35-38 are rejected under 35 U.S.C. 102(e) as being anticipated by Hwang et al.

Regarding claim 1, Hwang et al discloses on figure 2 a substrate comprising a base substrate 12; an interfacial bonding layer 16 disposed on the base substrate; and a thin film adaptive crystalline layer 14 disposed on the interfacial bonding layer wherein the interfacial bonding layer is solid at approximately room temperature and in liquid like form when above room temperature; the thin film adaptive crystalline layer 14 has a degree of flexibility to expand or contract its lattice constant along a direction parallel to a surface of the substrate when the interfacial bonding layer is in liquid like form; and the base substrate is mechanically strong enough to support the interfacial bonding layer and the thin film adaptive crystalline layer thereon.

Regarding claim 2, Hwang et al discloses on figure 2 the thin film adaptive crystalline layer 14 comprises approximately the same crystalline lattice structure as $\text{In}_x(\text{Al}_y\text{Ga}_{1-x})_{1-y}\text{As}$ where x is approximately 15% to approximately 45% (col. 8, lines 4-5).

Regarding claim 3, Hwang et al discloses on figure 2 the substrate comprises a substrate for formation of a vertical cavity surface-emitting laser based on $\text{In}_x(\text{Al}_y\text{Ga}_{1-y})_{1-x}\text{As}$.

Regarding claim 4, Hwang et al discloses on figure 2 X is approximately 15% to approximately 45%.

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Regarding claim 5, Hwang et al discloses on figure 2 above room temperature comprises a temperature of approximately 80C to approximately 600C.

Regarding claim 6, Hwang et al discloses on figure 2 thin film adaptive crystalline layer 14 comprises InGaAs with an In composition between approximately 15% and approximately 45% (col. 8, lines 4-5).

Regarding claim 7, Hwang et al discloses on figure 2 the thin film adaptive crystalline layer 14 comprise a compound semiconductor.

Regarding claim 8, Hwang et al discloses on figure 2 the compound semiconductor comprises InP, GaAs, GaSb or InAs (col. 3, lines 40-45).

Regarding claim 9, Hwang et al discloses on figure 2 the base substrate 12 comprises a semiconductor, an inorganic material or a combination thereof.

Regarding claim 10, Hwang et al discloses on figure 2 the semiconductor comprises GaAs, InP, GaP, Si or Ge.

Regarding claim 11, Hwang et al discloses on figure 2 the interfacial bonding layer 16 comprises a single layer of the same material or multiple layers of different materials.

Regarding claim 12, Hwang et al discloses on figure 2 the single layer of the same material or the multiple layers of different materials comprise Bi, In, Pb, Sn, Al or Ni; or a metal alloy; or inorganic materials.

Regarding claim 13, Hwang et al discloses on figure 2 the interfacial bonding layer 16 comprises multiple thin metal film wherein some of the films comprise liquid like

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form at a temperature above room temperature, and some of the films remain solid at the temperature above room temperature.

Regarding claim 14, Hwang et al discloses on figure 2 the temperature above room temperature comprises a temperature of approximately 80C to approximately 600C.

Regarding claim 15, Hwang et al discloses on figure 2 the expansion or contraction of the lattice constant accommodates material epitaxial growth.

Regarding claim 16, Hwang et al discloses on figure 2 a substrate comprising a base substrate layer 12; and a relaxed strain thin film adaptive crystalline layer 14 bonded to the base substrate layer and having a surface in plane lattice constant different from that of the base substrate layer and close to that of a target material system.

Regarding claim 17, Hwang et al discloses on figure 2 the in plane lattice constant is in the same range as that of $\text{In}_x(\text{Al}_y\text{Ga}_{1-x})_{1-x}\text{As}$ where x is approximately 15% to approximately 45% (col. 8, lines 4-5).

Regarding claim 18, Hwang et al discloses on figure 2 the substrate comprises a substrate for formation of a vertical cavity surface-emitting laser based on $\text{In}_x(\text{Al}_y\text{Ga}_{1-y})_{1-y}\text{As}$.

Regarding claim 19, Hwang et al discloses on figure 2 X is approximately 15% to approximately 45%.

Regarding claim 20, Hwang et al discloses on figure 2 the thin film adaptive crystalline layer 14 comprises InGaAs having an In composition between approximately 15% and approximately 45%.

Regarding claim 21, Hwang et al discloses on figure 2 the base substrate 12 comprises GaAs and the thin film adaptive crystalline layer comprises $\text{In}_x(\text{Al}_y\text{Ga}_{1-x})_{1-x}\text{As}$.

Regarding claim 22, Hwang et al discloses on figure 2 X is approximately 15% to approximately 45%.

Regarding claim 23, Hwang et al discloses on figure 2 the thin film adaptive crystalline layer comprises a semiconductor.

Regarding claim 24, Hwang et al discloses on figure 2 the semiconductor comprise InGaAsP, GaSb, InGaAs, InGaP, AlGaP or InAs.

Regarding claim 25, Hwang et al discloses on figure 2 the base substrate layer 12 comprises semiconductor, an inorganic material, a metal or a combination thereof.

Regarding claim 26, Hwang et al discloses on figure 2 the semiconductor comprise GaAs, InP, GaP, Si or Ge.

Regarding claim 27, Hwang et al discloses on figure 2 the inorganic material comprises sapphire, poly-crystalline boron nitride or ceramics.

Regarding claim 28, the claim limitation is merely product by process and therefore not given patentable weight.

Regarding claims 35- 38, Hwang et al discloses on figure 2 all the structure set forth in the claimed invention.

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The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US Patent 6372356 B1 to Thornton et al disclose a compliant substrate.

US Patent 5633516 to Mishima et al discloses lattice mismatched crystal structure.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Nguyen whose telephone number is (703) 308-1269. The examiner can normally be reached on Monday-Friday, 7:30 am- 4:30 pm

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned is (703) 308-7382 for regular communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JN
October 1, 2002



EDDIE LEE
SUPERVISORY PATENT EXAMINER
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